Module to Unstick ADC Codes

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DUNE 35T

March 2, 2016

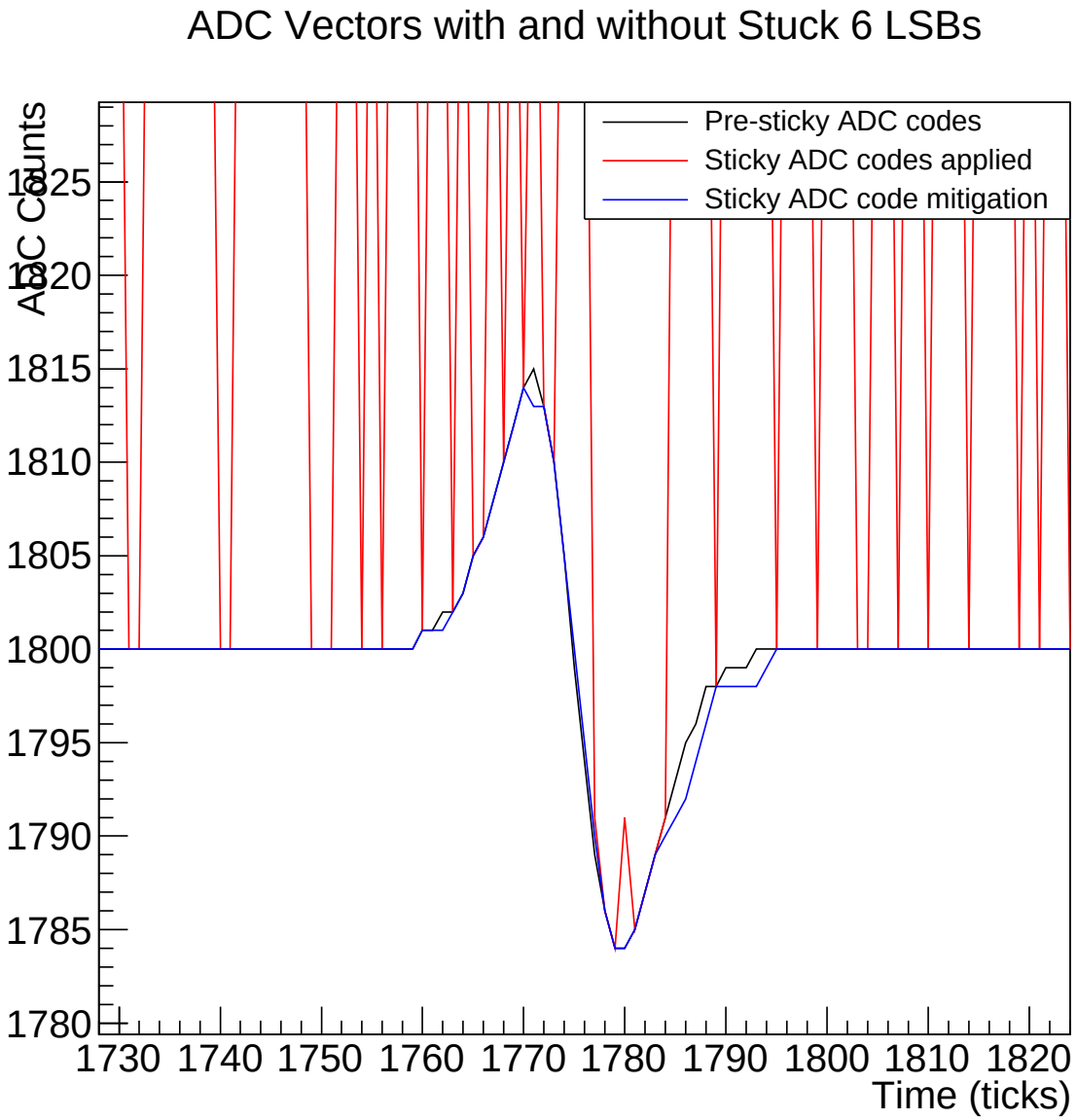
ADC Sticky Code Issue

- Linearity study of 35t ADC ASICs (for TPC wire planes) found that 6 LSBs frequently “stick” at 000000 (0x00) or 111111 (0x3F)
- Total “stuck ADC code” probability at cryogenic temperatures estimated at average of 22%
- Proper overflow and underflow probabilities are now used by SimWireDUNE35t, loaded from dune_pardata
- Software mitigation by linear interpolation over ADC vector waveforms in RawDigits is extremely promising for dealing with sticky ADC codes in 35t results

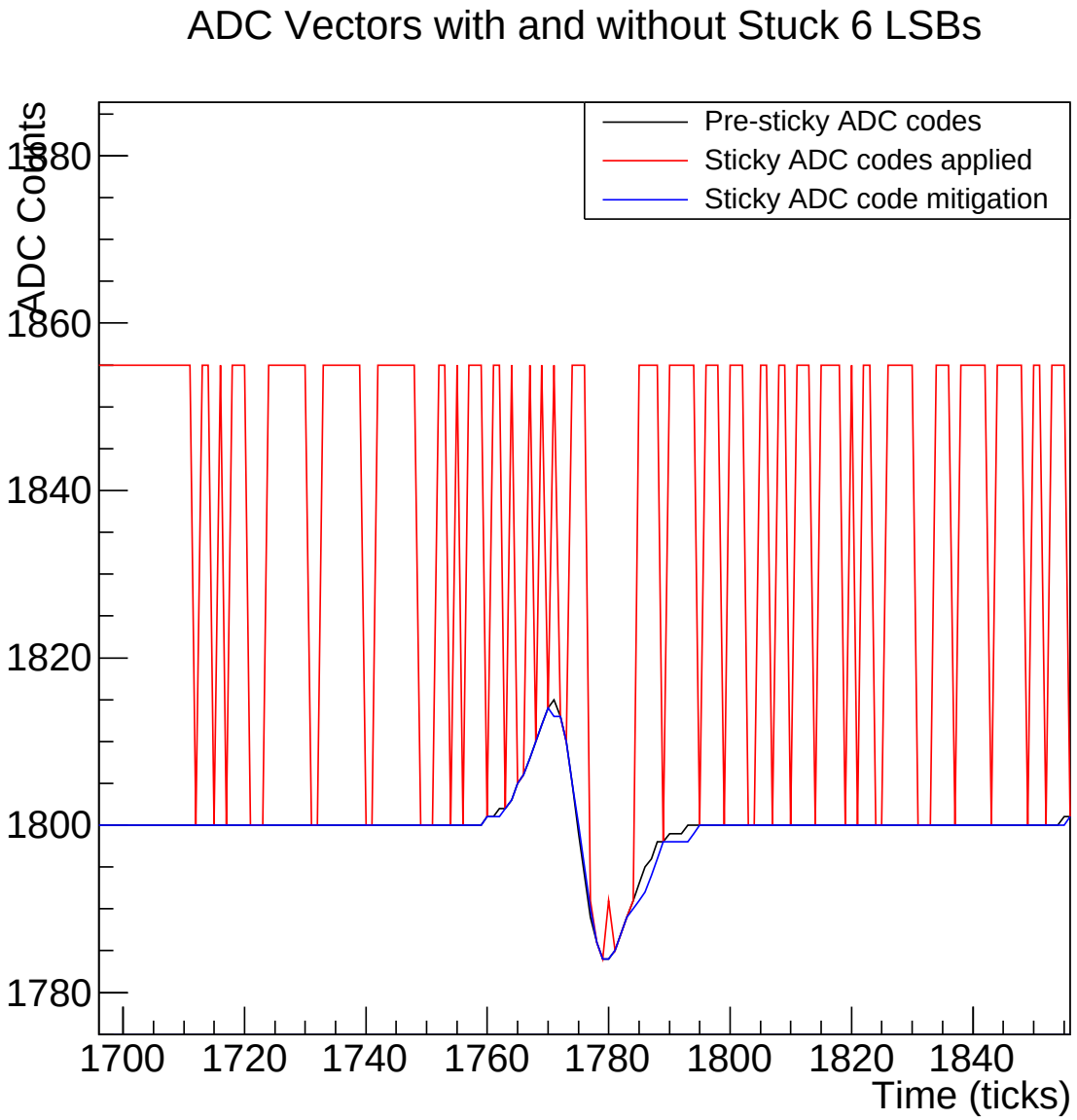
ADC Sticky Code Mitigation

- New module “UnstickADCCodes” created to read in RawDigit collections and output mitigated RawDigit ADC vectors as first step in reconstruction
- Each ADC vector is scanned over for entries ending in 000000 or 111111
- If first ADC value has LSB of 0x00 or 0x3F, default to pedestal
- If 6 LSBs of code are found to be 0x00 or 0x3F, we scan ahead to find next entry without stuck 6 LSBs
  - If over some number (default 5) of following ADC codes appear to be sticking, we give up and default to pedestal
- Mitigated value is computed from linear extrapolation between previous entry and next unsticking entry

ADC Sticky Code Simulation and Mitigation



ADC Sticky Code Simulation and Mitigation



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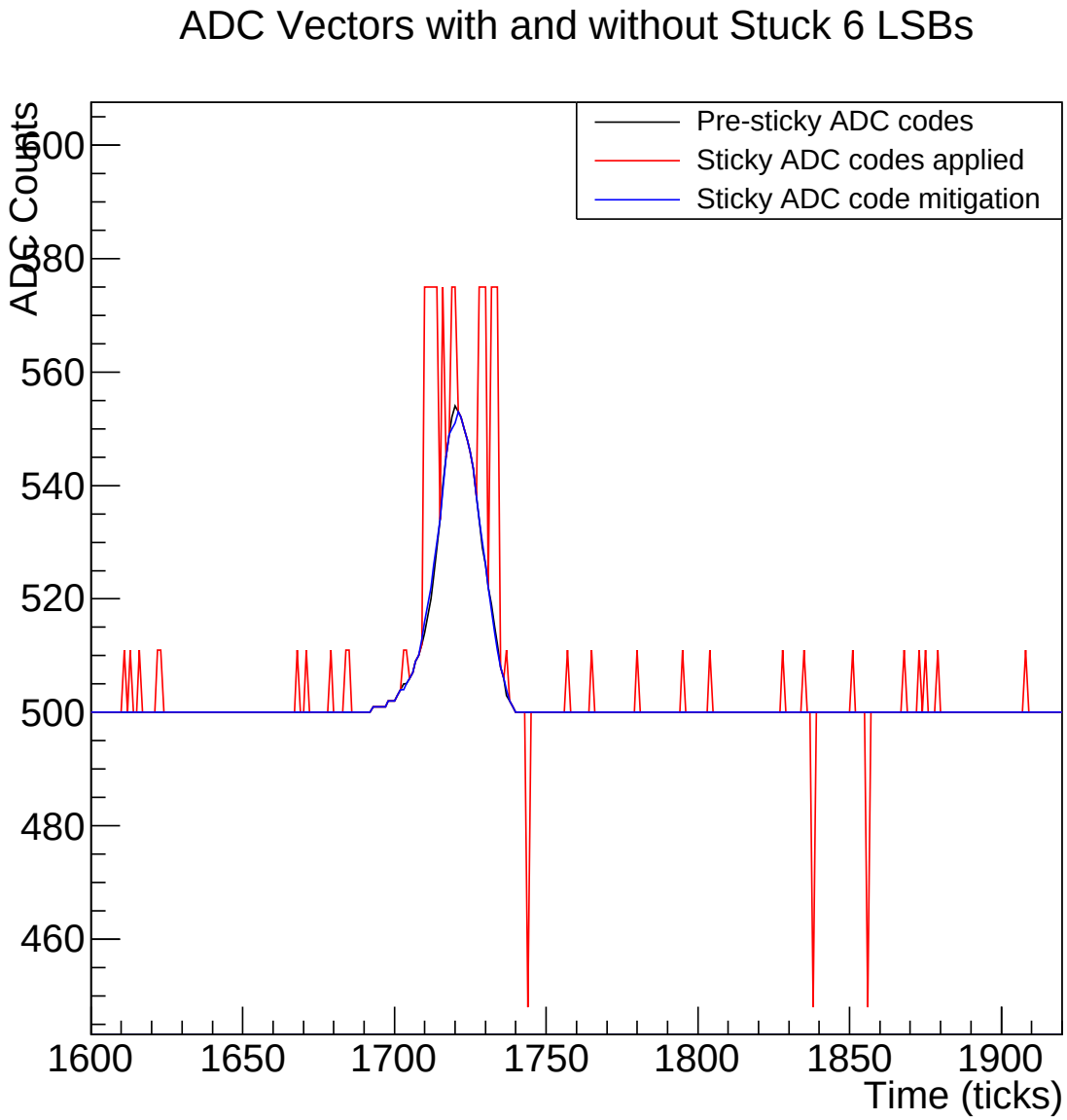

ADC Sticky Code Simulation and Mitigation